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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/685,538	10/16/2003	Hui Chun Liu	15256-US	5978

23553 7590 10/27/2005

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CANADA

EXAMINER	
LEE, JOHN D	
ART UNIT	PAPER NUMBER
2874	

DATE MAILED: 10/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	**Application No.**	**Applicant(s)**
	10/685,538	CHUN LIU ET AL.
	Examiner	**Art Unit**
	John D. Lee	2874

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 09/28/2005.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-36 is/are pending in the application.

4a) Of the above claim(s) 22-36 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-21 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) 1-36 are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 16 October 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 1003.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Applicant's election without traverse of Invention Group I (claims 1-21) in the reply filed on September 28, 2005, is acknowledged.

Claims 22-36 stand withdrawn from further consideration by the Examiner, 37 C.F.R. § 1.142(b), as being drawn to a non-elected invention.

The drawings filed in this application on October 16, 2003, are acceptable.

The disclosure has not been studied to the extent necessary to discover all possible minor errors therein. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 6,028,323 to Liu in view of U.S. Patent 5,892,222 to Elabd. Liu discloses a device for converting light of a first relatively short wavelength (i.e. infrared) to light of a second relatively longer wavelength (i.e. near infrared or visible). The Liu wavelength conversion device comprises an integrated stacked arrangement of a photodetector for generating a photocurrent in response to the detection of infrared radiation, and a light emitting element (LED) driven by the photocurrent to produce radiation in the near infrared or visible which corresponds to the detected infrared radiation. Liu does not disclose an avalanche multiplier (amplifier) for amplifying the photocurrent generated by the photodetector. Elabd, however, in an integrated semiconductor low-light photodetection apparatus, illustrates the importance of amplifying the detected light and discloses an avalanche multiplier for providing such amplification which can easily be integrated into the semiconductor layer structure. Given the disclosed importance of light amplification in a detection apparatus, and given the ease of integration of the Elabd avalanche multiplier in a semiconductor light detector structure, it would have been obvious to the person of ordinary skill in the art to have included an avalanche multiplier like that of Elabd in the Liu integrated wavelength converter structure. Such a multiplier would amplify the photocurrent generated by the photodetector so that driving the LED would be more efficient. The substrate upon which the Liu integrated structure is fabricated appears to be transparent to the wavelengths of radiation involved. Notice that Liu uses epitaxial growth technologies to produce the integrated structures, preferably using the hetero-system of InGaAs-InAlAs (or InGaAs-InP based on InP), although other III-V semiconductor materials can be used as well. It follows that any avalanche multiplier included in the integrated structure would also likely comprise InP and InPAs layers or III-V layers such as GaAs and GaAs/AlGaAs. Regarding applicant's claim 10, it appears that single substrate construction is preferred in Liu, but it is known in the art that sometimes individual element construction on separate substrates is preferred, followed by fusing together the individual substrates. This alternative type of fabrication would be an obvious alternative in Liu (even though not disclosed) because of the inherent advantages of individual substrate element construction. Regarding applicant's claim 12, the person of ordinary skill in the art would obviously conclude that Liu's mention of "infrared" radiation would include radiation within the wavelength range of 1.1 to 1.65 microns. The Liu arrangement allows for pixelless image upconversion or pixellized image upconversion. Regarding applicant's claims 16-21, notice that Liu also includes an off-the-shelf charge-coupled-device (CCD) camera for receiving the visible image, which camera is arranged in the same manner as in applicant's claims.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Other uses of avalanche photomultipliers in optical wavelength converting apparatus and methods can be seen in the cited U.S. Patents to Yoo ('627 and '827) and Hunt.

All of the prior art documents cited by applicant in the Information Disclosure Statement filed on October 16, 2003, have been considered and made of record. Note the attached initialed copy of form PTO-1449.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. § 103(a), the Examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR § 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the Examiner to consider the applicability of 35 U.S.C. § 103(c) and potential 35 U.S.C. §§ 102(e), (f) or (g) prior art under 35 U.S.C. § 103(a).

Any inquiry concerning the merits of this communication should be directed to Examiner John D. Lee at telephone number (571) 272-2351. The Examiner's normal work schedule is Tuesday through Friday, 6:30 AM to 5:00 PM. Any inquiry of a general or clerical nature (i.e. a request for a missing form or paper, etc.) should be directed to the Technology Center 2800 receptionist at telephone number (571) 272-1562, to the technical support staff supervisor (Team 8) at telephone number (571) 272-1564, or to the Technology Center 2800 Customer Service Office at telephone number (571) 272-1626.

John D. Lee

John D. Lee
Primary Patent Examiner
Group Art Unit 2874